

XLIX.—*Researches on the Latex and its Movements.*

By Prof. H. MOHL*.

THE author comments upon the variety of opinions that have been entertained concerning the latex, and considering the great importance of the subject in relation to vegetable physiology, and the entire incompatibility of M. Schultz's theory with all previous notions, he felt that it was necessary to make a careful examination of the facts on which that author had founded his theory. In the present paper he refers only to the last two works of Schultz, '*Mémoire sur la circulation et sur les vaisseaux laticifères dans les plantes*,' a prize essay which was crowned by the Paris Academy of Sciences in 1839; and '*Ueber die Cyklose des Lebenssaftes*' in the '*Nova Acta Acad. Nat. Curiosorum*,' 1841. He intimates that he shall probably consider the anatomical relations of the laticiferous vessels on a future occasion.

1. *Organization of the Latex.*

According to M. Schultz, the milky juices consist of a coagulable liquid in which float a number of globules. The globules are chiefly composed of fatty or waxy matters; the small globules of wax, and the larger of membranous sacs inclosing fatty substance. The liquid (plasma) coagulates when exposed to the air, a substance which he calls elatine (chiefly composed of caoutchouc), separating from it as fibrine does from coagulating blood. The globules do not participate in the coagulation; they present true vesicles containing a nucleus, and do not entirely dissolve in alcohol or æther, but shrivel up, and the fatty substance is then dissolved out.

Prof. Mohl states that he has obtained results which make M. Schultz's theory of the organization of the latex appear erroneous.

By placing a small quantity of latex between two slips of glass and sliding these over one another, it may easily be seen that the globules are composed of a softish, very viscid matter, that pressure unites them, and that there is no trace of an enveloping membrane; they may be collected and drawn out in a stringy mass, beneath the microscope, with the point of a fine needle. When a thin layer of latex is dried on glass, the liquid in which the globules float is changed into a transparent crust, which may be dissolved in water so as to re-establish the original condition of the sap. This dried serum forms a brittle mass, which, like a thin layer of gum, breaks with sharp angles, while the globules

* From the *Botanische Zeitung*, 1843, p. 553.

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retain their original form and condition. When this dried mass is exposed to the air for about twenty-four hours, particularly if placed in the sun, the elastic substance of which the globules are composed contracts in the cavities of the serum, presenting the appearance of vesicular membranes containing nuclei; but the solution of the serum in water clearly proves this to be an illusion.

From the above, it evidently results that caoutchouc is neither contained in the serum nor does it inclose the globules when dried, since the serum dissolves easily in water and dries into a brittle crust, which cannot be a membrane of caoutchouc, as M. Schultz called it. From the physical structure of the globules, it is hardly to be doubted that they contain caoutchouc, though probably it is often combined with other substances. When a layer of dried latex is macerated in alcohol the globules are not dissolved, but when the dried serum is redissolved in water it contains numerous little brownish flocks (coagulated albumen?). When dried latex is macerated in æther, the dried serum is found to contain, not globules, but open cavities filled with air; no trace of viscous matter remaining, but the crust of serum very brittle.

Æther only determines a coagulation of the latex, inasmuch as it liquefies the globules, and at its evaporation leaves them in the form of a membrane. Alcohol acts differently; it mixes with the latex and separates white membranes from it. By means of the microscope, these membranes are seen to be formed out of a substance separated from the serum, having a granular appearance, lax cohesion, and absolutely devoid of viscosity; they inclose a number of unaltered globules. Prof. Mohl suggests that this substance may be albumen.

From the foregoing it will be seen that the globules are destitute of any trace of organization, and can no more be compared with blood-corpuscles than can any other drops of resin, oil, &c. met with in vegetable fluids. The caoutchouc of the latex cannot be compared with the fibrine of the blood, since it is not met with, as that is, in solution in the serum, and does not transform this latter into a plasma; it is met with, on the contrary, in a complete state of development under the form of globules.

2. *Movement of the Latex.*

The mutual attraction and repulsion of the globules and the walls of the vessels, the *autosyncrasie* and *autodiocrasie* of M. Schultz, our author sets down as pure creations of fancy. He says that it is nothing more than ordinary molecular motion, and takes place equally in fresh latex and that which has been diluted with water or dried and redissolved.

The movement in the form of a current is, according to M.

Schultz, independent of external influences ; Prof. Mohl states that the latex in its natural condition is in a state of absolute repose. By bringing portions of uninjured plants of *Chelidonium* beneath the microscope, he found that while the connexion between the leaf under examination and the rest of the plant was unbroken, a current could generally be perceived which lasted for about half a minute and then gradually ceased ; he satisfied himself that this was produced by the torsion and compression of the vessels of the neighbouring parts. When the petiole was cut across, a very rapid current took place towards the wound, which continued until the coagulation of the extravasated latex closed the wounded vessels. On cutting a little further up, the current was set up again. In the leaves of *Tragopogon mutabilis*, where the principal nerves take a rectilinear direction, the current could be made to flow from the summit to the base, or from the base to the summit of the leaf, according as the apex or the petiole of the leaf was cut off. The slightest pressure, also, affected the direction of the current.

The author denies also that the rotation in the cells of *Tradescantia*, &c. takes place in delicate vessels situated on the walls of the cells, as indicated by M. Schultz ; since no such vessels can be traced, and the size and position of the currents are frequently seen to change in a manner which the idea of the contraction and dilatation of such vessels is insufficient to explain.

3. Of the *Latex as the Vital Juice*.

M. Schultz compares the latex to the blood of animals, not only as regards its internal organization and its movements, but as regards its physiological value, declaring it to be the nutrient fluid of plants.

Prof. Mohl says, that if he has succeeded in proving "that the latex does not possess the internal organization which M. Schultz attributes to it ; that it differs in no particular, as far as regards its globules, from other vegetable juices which contain substances insoluble in water, such as oils, resin, or starch ; that M. Schultz's theory of the coagulation is based upon false observation, and that the latex in uninjured plants exhibits no movement"—he might abstain from further detail, convinced that all unprejudiced observers would arrive at the same conclusions : if these observations are confirmed by others, it will necessarily be seen that those very points on which M. Schultz founded his theory, and which alone have determined him in establishing his doctrine, are founded on illusions.

In addition to erroneous observation, however, M. Schultz's theory is supported by the application of an analogy which he has established between plants and animals. He concludes, that

as the blood presents a visible organization, the nutrient fluid of plants must also. And why? asks Prof. Mohl: there is no reason which should force such a conclusion on us; on the contrary, the presence of granules could scarcely have any relation to the nutrient power of the vegetable juice. The anatomical conditions of the plant would present every difficulty to their movement; and if, with M. Schultz, we perforate the walls of cells to give passage to vessels which no one has seen, we may establish whatever physiological laws we please, and any kind of deductions from them.

The *elatine* is not the true organic constituent of the latex which represents vegetable fibrine. This comparison has been shown above to be founded on errors of observation; but it will be seen to be still more contrary to nature, if we consider the chemical relations of fibrine and caoutchouc. While animal bodies are almost entirely composed of fibrine, or chemical combinations nearly identical with it, the great mass of the substance of vegetables is formed of matters which equally present the greatest chemical affinity to each other, which frequently pass from one into the other, and may be artificially transformed; and all these differ extremely from caoutchouc, since the latter contains no oxygen. How is it possible, asks the author, to consider the almost insoluble caoutchouc as the principal agent in the nutrition of plants? It is contrary to all the most recent observations in vegetable physiology. The latex is found in the smallest proportion in the youngest parts, where formation and nutrition are most active, and where it would be most necessary; while caoutchouc, from its chemical composition, cannot be included in the series of neutral combinations through which we have a right to admit a direct passage from sugar to ligneous fibre. M. Schultz is also unable satisfactorily to explain the fact that the milky juices are mostly poisonous.

Prof. Mohl concludes by stating that he is absolutely ignorant of the physiological value of the latex. We have no positive facts on which to base any certain theory; but one thing, he says, is settled, which is, that the theory of M. Schultz must be regarded as an entirely unsuccessful attempt to resolve the enigma, and that the term vital juice must be rejected.

L.—*Notes on the Synonymy of the Genus Apion, with Descriptions of Five new Species, &c.* By JOHN WALTON, Esq.

SOME time back I made an attempt to correct the synonymy and to determine the species of the interesting little British *Curculionites* arranged under the generic title *Apion**. I have since

* See Ent. Mag. vol. v. p. 8. and p. 254.